1.0 VOLUME II ACCREDITATION SUPPORT PACKAGE DESCRIPTION

Volume II of the Accreditation Support Package (ASP-II) contributes to logical verification and face validation activities by providing software design information and the results of sensitivity analyses that characterize model functionality. Assumptions and limitations inherent in the model design can be found in the Conceptual Model Specification in Section 2.0, and the results of exercising the FEs over ranges of input conditions are reported in the Sensitivity Analysis results of Section 3.0. Other V&V activities that contribute to an SME review in support of Phase II accreditation are described in the SMART Verification, Validation, and Configuration Management (VV&CM) process description document [1]. Results of SME review activities are usually application-specific and reported in accreditation findings or recommendations, which are not included here.

1.1 CONCEPTUAL MODEL SPECIFICATION

The purpose of logical verification is to identify and compare the model assumptions, limitations, and approximations with the phenomena being modeled to ascertain whether the conceptual model (and its resultant implementation in the code) can reasonably be expected to produce realistic results when compared with real-world phenomena. Logical verification ensures that the basic equations and algorithms comprising a model are correct within the bounds of the stated limitations, and helps to determine the appropriateness of a model for a particular application. This activity has also been called conceptual validation, even though comparisons to reality are usually intuitive rather than explicit. In the terminology adopted by JASA, verification implies examination of code, while validation requires comparisons with data.

ASP-II information contributes to logical verification efforts by providing the user with a detailed description of the model design requirements, approach, and implementation, as well as limitations, assumptions, and approximations at the FE level. This information should allow the model user to determine the range of applications for which the model can be reasonably expected to produce valid results. It remains for the user, of course, to compare this range with that required for the application at hand, and to make a determination of model suitability.

1.2 SENSITIVITY ANALYSIS RESULTS

Sensitivity analyses are performed to examine functional performance of an FE over a range of input conditions. The purpose is to define or establish behavior of the function and its relative contribution to outputs generated by the model or simulation. It also serves to define data requirements, accuracies, and rates necessary to validate the function. Because the results of such analyses often illustrate expected or reasonable performance, they are often conducted during the process of reviews intended to establish face validity.

ASP-II contributes to face validation by providing the results of detailed sensitivity analyses performed on the model and each of its functional elements. To complete face validation, it remains for the user to perform input data V&V, to compare model outputs with acceptable results (e.g., from intelligence sources or other models), and to review all of these with respect to model acceptability criteria that are dependent upon the intended

application. Sensitivity analyses are normally found in Section 3; however, this was outside the scope of the task order under which this document was prepared.

1.3 LOGICAL VERIFICATION

Logical verification is an analysis activity that results in assessments of code implementation. It is similar in nature to desk checking activities associated with detailed code verification, but typically not performed at the same level of detail. Consisting of reviews of available design documentation and appropriate portions of the code, it is aimed at determinations of whether inherent assumptions and approximations are consistent with user requirements. When performed in conjunction with software development activities, logical verification is often accomplished incrementally, as critical portions or modules are completed and tested. When conducted as part of an accreditation support effort or on legacy codes, it is often performed with application specific requirements in mind and the level of examination can be very detailed in certain code areas. During such reviews, Computer-aided Software Engineering (CASE) tools are often used to aid in understanding the code (especially in the absence of documentation) as well as to document design features and/or limitations.

Reviews that take advantage of ASP documentation will be focused on the CMS sections for those FEs deemed critical for proper implementation of user requirements. Software testing of modules may also be accomplished to verify suspected errors or problems and reports of findings produced to support higher level assessments and accreditation decisions. Capturing these results in ASP-II extends their benefits beyond current accreditation (or development) efforts by allowing all other and subsequent reviewers to leverage their findings and recommendations. Logical verification would normally be found in Section 4; however, this was outside the scope of the task order under which this document was prepared.

1.4 FACE VALIDATION

Face validation is an analysis activity that results in assessments of credibility based upon model outputs for well defined input and operating conditions. It is usually accomplished by SMEs who have detailed knowledge of real world results of the phenomena being modeled. Their review typically addresses input data sources, input scenarios or conditions, and an analysis of model outputs relative to known or believed outcomes from similar situations. Face validation is not results or performance validation in the classical sense, but it provides a stronger endorsement of the model or a more authoritative statement of model credibility than the mere fact that a model is widely used and accepted. While expert opinion has been the traditional validation method of choice, its value is contingent upon the independence and level of expertise of the reviewers, and the scope of the review itself.

Face validation reviews usually include (but are not limited to) results of the following activities:

- Input data verification, consisting of a review of model input data sources and consistency of definition of how the data were collected, as well as a clear definition of how the data are used in the model;

- Input data validation, consisting of a comparison of user input and embedded data to the corresponding known (or best estimate) real world values;
- Comparison of model outputs with intelligence data or analyses, and/or known or best estimates of real world values for corresponding phenomena, and;
- Functional and/or model level sensitivity analyses.

The results of any face validation would normally be found in Section 5; however, this was outside the scope of the task order under which this document was prepared

1.5 DOCUMENT ORGANIZATION

Section 2 contains the software design requirements and specifications for the Platform, Environment, and Command, Control, and Communications (C3) FEs that are listed in the FAT in Appendix A. The sections are numbered according to their order of appearance, but the FE designators that appear at the top of each page correspond to those in the FAT. A cross-reference matrix is presented in Table 1.0-1. Decomposition of SWEG into generic, identifiable FEs that correspond to real-world platforms with their constituent attributes and subsystems, physical and man-made environments, and C3 capabilities formed the basis for the FAT, and provides a framework for reporting results and comparing functionality among similar models.

The scope of this documentation task was limited to a high-level FE CMS for the constructive or stand-alone use of SWEG only and include top-level design requirements, design approaches, and software descriptions. The design approaches are not appropriate for detailed verification but should be adequate for logical verification by SMEs. In addition, Sections 3, 4, and 5, which are Sensitivity Analyses, Logical Verification Results, and Face Validation Results, respectively, are not available in this edition. Some sensitivity analyses are planned as a follow-on effort and will be reported in a subsequent edition.

TABLE 1.0-1. Functional Element Cross Reference Matrix.

FUNCTIONAL AREA	#	FUNCTIONAL ELEMENT	2.0 CMS
I Platform			
		1.0 Attributes	
	1	1.1 Configuration	2.1
	2	1.2 Movement	2.2
	3	1.3 Signatures (EO/IR/RF/UV)	2.3
	4	1.4 Vulnerability	2.4
	5	2.0 Sensors	2.5
	6	3.0 Weapons	2.6
	7	4.0 Comm Devices	2.7
	8	5.0 CM/CCM	2.8
		6.0 Decision Making Elements	
	9	6.1 Capabilities	2.9
	10	6.2 Knowledge Base	2.10
	11	6.3 Logic Processes	2.11
II Environment			
	12	1.0 Atmospheric Characteristics	2.12
	13	2.0 Topographic Characteristics	2.13
	14	3.0 Bathymetric Characteristics	N/A
III Command Control and Communications (C^3)			
	15	1.0 Command Chain Hierarchy	2.15
	16	2.0 Network Communications	2.16
	17	3.0 Areas of Interest/Responsibility	2.17